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Heart Failure

IMPAIRED SYSTEMIC OXYGEN EXTRACTION IN HEART FAILURE WITH PRESERVED EJECTION FRACTION

ACC Moderated Poster Contributions
McCormick Place South, Hall A
Monday, March 26, 2012, 9:30 a.m.-10:30 a.m.

Session Title: Delineating Exercise-related and Hemodynamic Abnormalities in Chronic Heart Failure
Abstract Category: 14. Heart Failure: Clinical
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Background: Exercise Capacity is similarly impaired in patients with heart failure with preserved LV ejection fraction (HFpEF) and HF with reduced LVEF (HFrEF). However, relative contributions of cardiac output (CO) and arterio-mixed venous oxygen content difference (C(a-v)O2) to VO2 during exercise in HFpEF vs. HFrEF are unknown. We hypothesized that HFpEF would be associated with impaired O2 extraction during exercise (i.e. C(a-v) O2<14ml/dL and CvO2>5ml/dL).

Methods: We studied consecutive heart failure patients referred for cardiopulmonary exercise testing (CPET) with invasive hemodynamic monitoring who had RER>1.05, and resting, supine pulmonary capillary wedge pressure (PCWP)>15mmHg with LVEF>0.50 (HFpEF, N=40) or LVEF<0.40 (HFrEF, N=56). Simultaneous Fick CO, arterial and mixed venous blood gases were measured every minute throughout incremental upright cycle-ergometry CPET.

Results: Despite no differences in age, BMI, hemoglobin level, or CaO2, and similar peak VO2, patients with HFpEF demonstrated higher CO and lower C(a-v)O2 throughout exercise compared to patients with HFrEF (Figure). At peak exercise, CvO2 fell normally in HFrEF (4.7±1.4 ml/dl) but not in HFpEF (6.7±1.9 ml/dl, P<0.0001).

Conclusions: Patients with HFpEF extract O2 less avidly during exercise than patients with HFrEF. Impaired O2 extraction in HFpEF may reflect intrinsic abnormalities in skeletal muscle or peripheral vascular function and represents a potential target for therapeutic intervention.

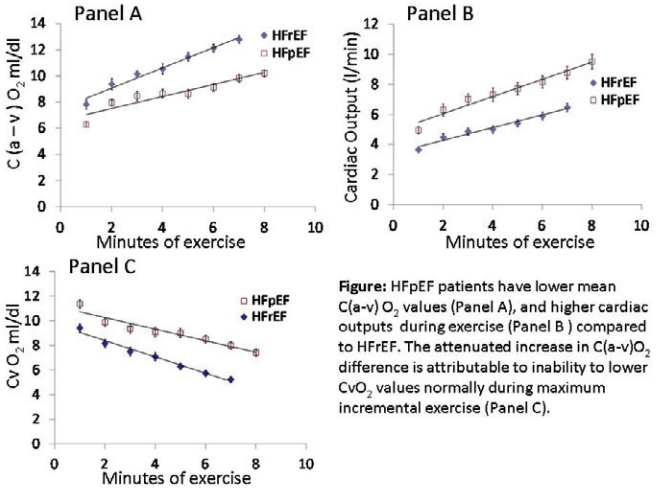

Figure: HFpEF patients have lower mean C(a-v) O_2 values (Panel A), and higher cardiac outputs during exercise (Panel B) compared to HFrEF. The attenuated increase in C(a-v)O_2 difference is attributable to inability to lower CvO_2 values normally during maximum incremental exercise (Panel C).